The Downside of Stormwater Runoff Management: Disease Vectors & Structural BMPs in Southern California

Marco E. Metzger, Ph.D.
Vector-Borne Disease Section
California Department of Health Services

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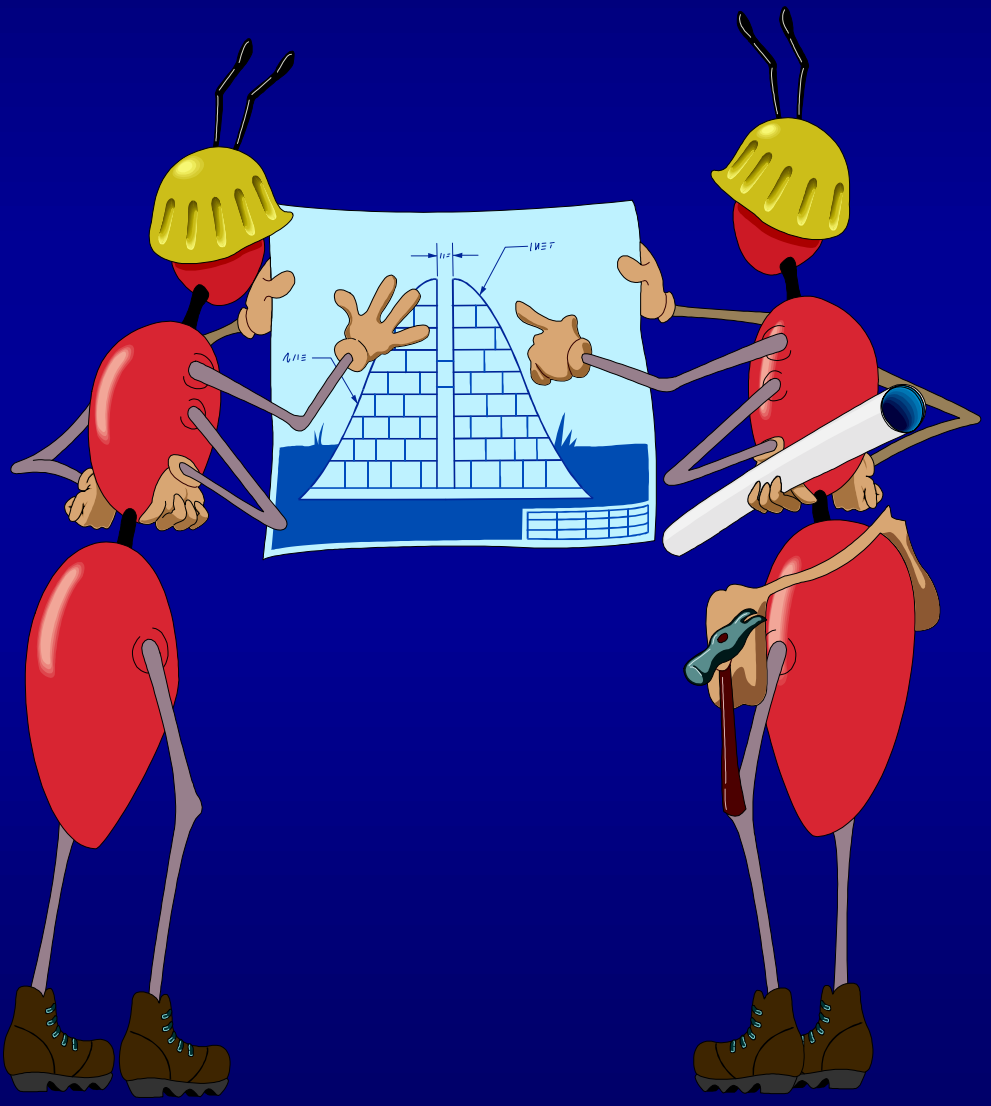
BMPs and Public Health

BMPs potentially create a public health hazard by increasing habitat availability for aquatic stages of mosquitoes, and by creating harborage, food, and moisture for other reservoir and nuisance species

Two Primary Factors Contribute to Mosquito Production in BMPs



1) Design

2) Maintenance

Habitats Created by BMP Design

RETENTION PONDS

Habitats Created by BMP Design

SPREADER TROUGHS

Habitats Created by BMP Design

RIP
RAP

Habitats Created by BMP Design

SUMPS, CATCH BASINS, & SETTLING BASINS

COVERED / BELOW-GROUND

Habitats Created by BMP Design

CATCH BASINS & SETTLING BASINS

EXPOSED

Maintenance & Mosquito Habitats

VEGETATION OVERGROWTH / INVASION

Maintenance & Mosquito Habitats

VEGETATION OVERGROWTH / INVASION

Maintenance & Mosquito Habitats

CLOGS

Maintenance & Mosquito Habitats

SILT / DEBRIS BUILD-UP

Other Factors

Other Factors

NON-STORMWATER RUNOFF

Caltrans
Stormwater BMP Retrofit Pilot Study

Vector Component

Provided technical expertise on vectors and vector-borne diseases

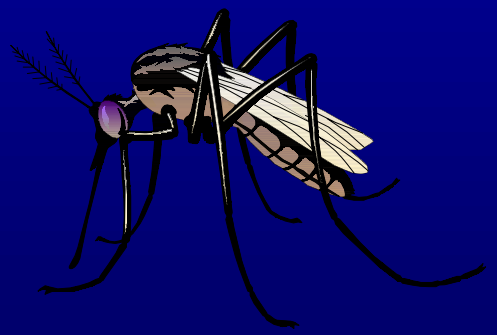
- **CDHS-VBDS**
- **GLACVCD, LACWVCD, SGVMVCD, SDCVSC**
- **University of California**
- **Stormwater consultants**

Two -Year Study Objectives

- Establish a comprehensive vector surveillance and monitoring program (37 structures, 8 BMP types, 31 sites)
- Document and evaluate vector production at BMP sites
- Recommend appropriate alterations and design modifications

Mosquitoes Breeding in Caltrans BMPs

- *Culex quinquefasciatus*
- *Culex tarsalis*
- *Culex stigmatosoma*
- *Anopheles hermsi*
- *Anopheles franciscanus*
- *Culiseta incidens*
- *Culiseta inornata*
- *Ochlerotatus squamiger*



Mosquito Monitoring

"Dip Sampling"

Frequency, Density, & Habitat Size

Wet Basin

~1400 m^2

0.28 / dip

MCTT

61 m^2

24.1 / dip

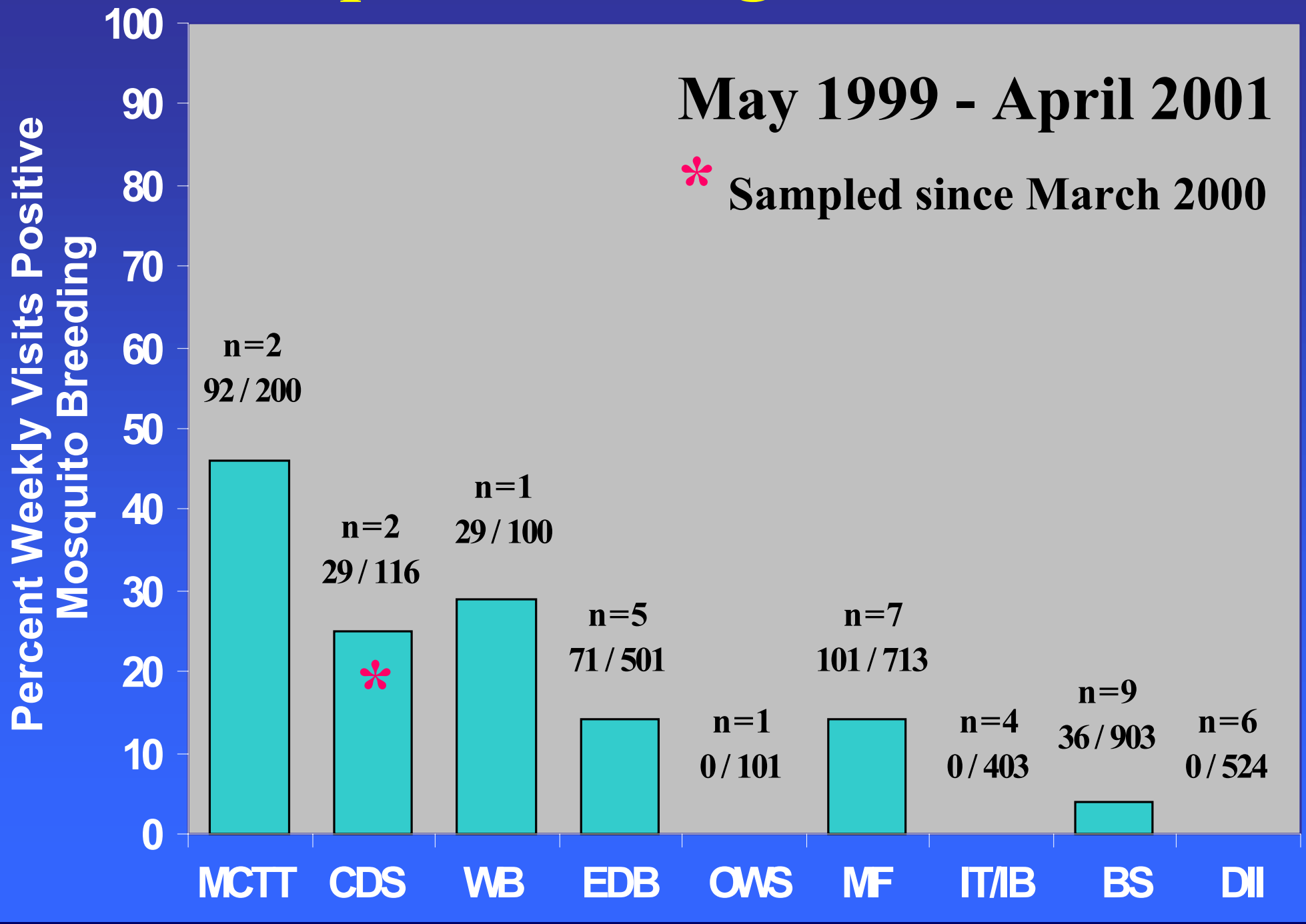
CDS

0.66 m^2

64.8 / dip

Average number of mosquito larvae per "dip" in May 2000 (5 site visits)

Mosquitoes Breeding in Caltrans BMPs



Mosquito Control

- Adults = "Adulticides"
  - Ground applications
  - Aerial applications
- Immatures = "Larvicides"
  - Insect growth regulators (methoprene)
  - Microbial insecticides (Bti)

Integrated Mosquito Management

- Environmental manipulation
  - Water or vegetation management
- Biological control
  - Mosquitofish
- Chemical control
  - Insect growth regulators (methoprene)
  - Microbial insecticides (Bti)
- Legal authority to protect public health
  - California Health and Safety Code

The Proactive Approach with BMPs: Design the Bugs Out

- Avoid creating "public nuisances", potential fines, and corrective measures
- Dwindling number of insecticides and resistance
- Reduce long-term costs of vector control
- Reduce potential complaints and maintain good public perception

Note: Certain BMP designs will require routine vector monitoring

Mosquito Prevention Solutions

Source:
Invasive vegetation

Mitigation:
Annual vegetation management

Wet Basin
I-5/La Costa (east)
(Site # 111104)

Mosquito Prevention Solutions

Mosquito net covering sand media filter pump sump

Sand Media Filter (Austin Type)
Foothill Maintenance Station
(Site # 74203)

Mosquito Prevention Solutions

Source:
Loose-rock energy dissipaters

Biofiltration Swale
I-5/I-605
(Site # 73224)

Mitigation:
Grouted energy dissipaters

Biofiltration Swale
I-605 Del Amo Avenue
(Site # 73225)

Mosquito Prevention Solutions

Source:
Below-ground, covered sump

Continuous Deflective Separator
I-210 East of Filmore St.
(Site # 73103)

Mitigation:
"Mosquito proof" access points

Mosquito Prevention Solutions

Source:
Exposed sedimentation basin

Mitigation:
Aluminum "Smoke proof" cover

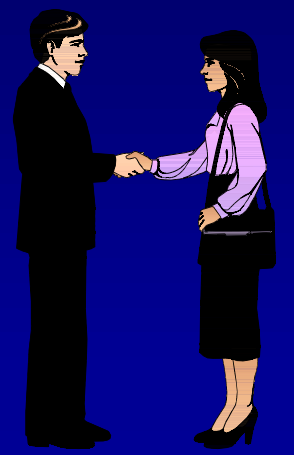
Multi-Chambered Treatment Train
Lakewood Park & Ride
(Site # 74208)

Wasted Effort?

Minimizing / eliminating mosquito breeding habitats from BMPs requires a proper and timely maintenance plan!

Mosquitoes are highly opportunistic!

Building a Better BMP



- Collaboration and cooperation is the key to suppressing vector populations
- Vector control agencies can provide valuable input into design and maintenance plans
  - Extensive knowledge of local vector species biology, seasonality, and habitat preferences
  - Point out potential problems or "red flags"

It is critical that as structures are built to improve water quality, public health hazards are not created.